

US-based MPGD User facility

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On behalf of MPGD community in the US

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MPGD Community in the US

List of US institutions involved in MPPD development / activities for experiments in different field of particle physics

Nuclear Physics

- Thomas Jefferson National Accelerator Facility, Newport News, VA 23606
- Univ of Virginia Physics Department, Charlottesville, VA 22904
- Florida Institute of Technology, Melbourne, FL 32901
- Department of Physics and Astronomy, Michigan State University, East Lansing, MI 48824
- Facility for Rare Isotope Beams, Michigan State University, East Lansing, MI 48824
- Temple University, Philadelphia, PA 19122
- Brookhaven National Laboratory, Upton, NY 11973
- Vanderbilt University, Nashville, TN 37240
- Hampton University, Hampton VA 23668
- Bates MIT, Middleton, MA 01949
- Stony Brook University, Stony Brook, NY 11794
- Yale University, New Haven, CT 06520

Dark Matter, Neutrinos and Physics Beyond the Standard Model

- University of Hawaii
- University of New Mexico
- Wellesley College
- Department of Physics, Duke University, Durham, NC 27708
- Triangle Universities Nuclear Laboratory, Durham, NC 27708
- University of Texas, Arlington, TX, 76019
- Department of Physics, North Carolina State University, Raleigh, NC 27695
- The University of North Carolina at Chapel Hill, Chapel Hill, NC 27599
- Fermi National Accelerator Laboratory, Batavia, IL 60510
- Department of Physics, Enrico Fermi Inst., [Kavli Inst. for Cosmological Physics](#), Univ. of Chicago, Chicago, IL 60637
- Mitchell Institute for Fundamental Physics and Astronomy, Texas A&M University, College Station, TX 77843
- Univ of Virginia Physics Department, Charlottesville, VA 22904
- Colorado State University, Fort Collins, CO 80523
- Los Alamos National Laboratory, P.O. Box 1663, Los Alamos, NM 87545
- Department of Physics, Occidental College, Los Angeles CA 90041
- Canisius College, Buffalo, NY, 14208
- Nuclear Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720

High Energy Physics

- Florida Institute of Technology, Melbourne, FL 32901
- University of Texas, Arlington, TX, 76019
- Yale University, New Haven, CT 06520
- University of Wisconsin-Madison, Madison, USA
- University of Hawaii, Department of Physics and Astronomy, Honolulu, HI 96822
- Department of Physics, Carleton University, Ottawa, ON, K1S 5B6, Canada
- University of Michigan,
- Rice University
- University of California at Los Angeles
- Texas A&M
- Wayne State
- Harvard University
- Boston University
- University of California at Davis
- Brandeis University

IF5 – WP4, WP5, WP6
A. Bellerive's talk
K. Black's talk
P. Lewis's talk

IF5 – WP3
C. O'Hare's talk

IF5 – WP2
M. Posik's talk

44 US institutions identified

MPGD Community in the US

- ❖ Large number of US institutions involved in MPPGD development in all fields of particle physics
- ❖ Little inter disciplinary interaction between the institutions
- ❖ Several of these US institutions are member of the CERN-based RD51 collaboration for the advancement of MPPGD technologies.
- ❖ Several US-MPPGD institution benefitted for several years from the facilities offered by CERN Gas Detector Development (GDD) lab to perform initial R&D and optimization for MPPGD technologies for to their specific experiment
 - There is no such space or facility in the US
- ❖ A small consortium of 8 to 10 of the US-NP institutions involved in generic detector R&D for the future Electron Ion Collider was formed and has been active for over 10 years. but its scope is limited to development of EIC detector technologies. Less than 25% of the list.
- ❖ The US-MPPGD community would greatly benefit from a “MPPGD User Facility” similar to CERN structures such as GDD lab

Motivation for US-MPGD User Facility

- ❖ Idea originates from brainstorming from MPGD members working on the Snowmass21 IF5-MPGD WP 2 (MPGD for Nuclear Physics)
- ❖ A consensus was formed around the need for a MPGD center / User Facility in the US where groups involved in MPGD technologies development will be able to share experiences and exchange ideas on
 - Detector R&D activities and detector performance characterization
 - Provide some technical support and scientific guidance for MPGD detector development
 - Educational aspect → Train the next generation of gaseous detector physicist
 - Promote MPGD technologies
- ❖ It will be an inter disciplinary US-MPGD User Facility, open and accessible to groups involved in MPGD development
 - HEP, NP, Neutrino Physics, Dark Matter Physics, Astrophysics ...
 - But also, Medical application and Homeland Security application
- ❖ The US-MPGD User Facility can be inspired by a couple of existing models
 - ❖ The CERN GDD
 - ❖ SiDet facility at Fermilab

Scopes and Goals of the MPGD User Facility

- ❖ General purpose MPGD lab for detector development, R&D and characterization
- ❖ Ideally host by one of DOE national lab where MPGD detectors
 - Jefferson Lab strongly supports the initiative and expresses interest in the idea of being a host Lab
- ❖ The US-MPGD User Facility core activities will be:
 - Detector R&D activities and detector performance characterization
 - Provide technical support and scientific guidance for detector development
 - Foster an environment where ideas are exchanged between groups and technical challenges and solution are shared

The CERN GDD Lab Model

EP-DT-DD GDD Laboratory (Detector R&D)

Technical support

MPGD Detectors

Gas system and services

MPGD Readout electronics

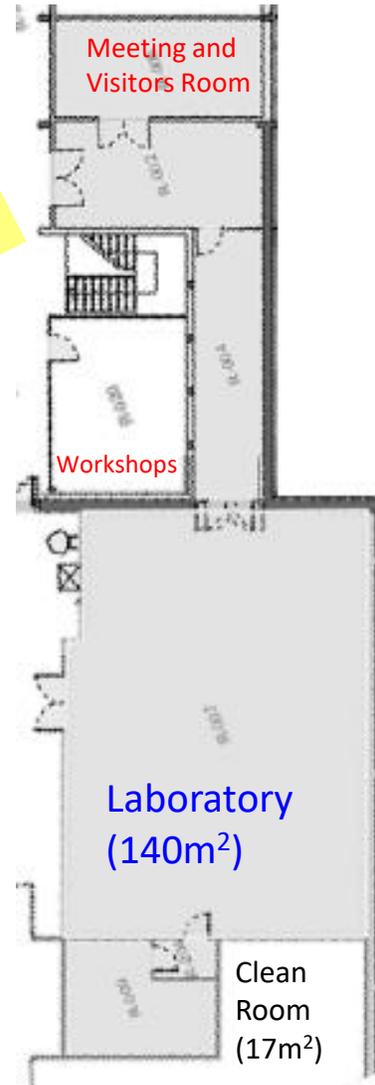
Radioactive Sources

Interface with CERN services (**Thin Film and Glass Lab, MPT Workshop**

, RP, gas, metrology, irradiation facilities,...),

Most breakthroughs in MPGDs over the last 10 years started with R&D initiated in the GDD lab

Most breakthroughs in MPGDs over the last 10 years were conducted by external groups with support from the GDD lab team



The CERN GDD model

EP-DT-DD GDD Laboratory (Detector R&D)

Permanent Users (ALICE, ATLAS, ESS) station



Temporary Users Working station



Active (X-Ray) and Radioactive Sources



Cosmic Stands



Clean Room



Workshops



Optical Readout & Measurements



Vacuum Systems



Gas & Monitoring system



MPGD Electronics



The SiDet model at Fermilab

- ❖ SiDet was originally built for the construction of the Tevatron (D) and CDF) silicon detectors.
- ❖ Subsequently it expanded significantly and many generations of silicon strip and pixel detectors, as well as other silico-based (CCD) and superconducting (MKIDs, SNSPDs, TES) detectors for Astro particle physics have been built.
- ❖ Funding for equipment came/comes partially from facility operations, and partially from projects, such as D0/CDF, CMS, DECAM, etc.

Jefferson Lab's interest as host of MPGD User Facility

- ❖ Jefferson Lab is a natural place for hosting a MPGD User facility in the US
 - The lab has a leadership role in the US for operating large scale MPGD detector in several high-profile experiment
 - JLab RD&I Group has recently consolidated its MPGD detector R&D activities with two new members expert in the field
 - The Experimental Hall D at JLab has pure 3 GeV electron for beam test facility that would be ideal for MPGD studies
- ❖ Jefferson Lab management strongly support the idea of US-MPGD User Facility
 - Meeting last Friday July 15th with C. Keppel (Head of Physic Division), D. Dean (JLab Deputy Director) and D. Weisenberger (RD & I Group Leader) to discuss the idea. Strong interest of the lab to be the host of the facility
- ❖ Friday's meeting was also attended by Dr David Cinabro, the DOE-NP Manager of User Facilities
 - Support the initiative and encourage us to explore it further and develop a strong proposal
 - Will discuss the idea with his DOE-HEP counterpart
 - Encourage us to organize a workshop to garner interest from the larger community and seek input on the needs and expectations
- ❖ Follow-up meeting with JLab management and Dr. Cinabro in early August
- ❖ We plan to organize a workshop involving all the MPGD communities to discuss the need for the MPGD User Facility
 - The scope and goals of such facility will be discussed and refined

Summary

- ❖ The idea of the need for an US-based MPGD facility emerges from discussions during the Snowmass2021 IF5 White Papers process
- ❖ The motivation for such facility would be to provide scientific and technical resources for groups involved in the development for MPGD
- ❖ Such facility would also create an environment to facilitate the exchanges between groups and sharing of experiences
- ❖ The Facility will be open to all groups in the US involved in MPGD activities in NP, HEP, Astrophysics medical and industrial applications ...
- ❖ A DOE lab will be a natural place to host such User facility
 - ❖ Jefferson Lab has expresses strong interest in being host and is very supportive of the idea

Back up